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ABSTRACT

Six primary and six intermediate grade students were involved in a study designed to describe the learning strengths and weaknesses of hearing-impaired children and the reading skills developed by them in the course of basal reading instruction. Because of the special communication problems involved in gathering data, an interdisciplinary team approach was used. The team included a reading consultant, an educational consultant specializing in the hearing impaired, a speech and langauge clinician, an audiologist, two classroom teachers trained to work with the hearing impaired, and a graduate assistant. Each child was assessed for auditory acuity and speech discrimination, vocabulary development, speech articulation, intellectual functioning, and reading skills. The results revealed that hearing-impaired children score significantly below norms for hearing children on language and reading measures, that audiometric measures indicate that phonic instruction is probably of little value, and that ratings of the children's performance by teachers are inconsistent with test results. (FL)

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The Development of Reading Skills in Hearing-Impaired Children

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Very little is known about reading instruction for hearing-impaired children. Curriculum materials and approaches specifically adapted for use with the hearing impaired are almost nonexistent. Yet studies of reading achievement indicate that hearing-impaired students typically encounter serious reading problems.

Wrightstone, Arrow, and Moskowitz (1963) found that less than 10% of 5000 deaf ten-year-olds read at or above the fourth grade

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level. Furth (1966) reported less than one year's growth in the average reading scores of deaf children (from 2.5 to 3.4) over a five-year instructional period.

At least two explanations might account for these reading problems. Poor reading achievement scores might be a reflection of limited language skills, or they might indicate inadequate development of the skills specific to reading.

Two aspects of the language skills of deaf children have been examined: (a) knowledge of vocabulary; and (b) knowledge of standard English usage. Vocabulary studies indicate that deaf children develop slower than hearing children and have relatively greater difficulty with abstract, as compared to concrete, terms. Usage studies indicate that knowledge of linguistic structure is poorly developed in deaf children, who display lack of linguistic flexibility and absence of complex syntax in their language use. The syntactic difficulties of deaf children have been known for many years, but there are no instructional materials specifically designed to deal with them.

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Standardized achievement tests have been used to assess the development of reading skills in the hearing impaired. These tests yield information concerning word recognition (vocabulary). There is no available evidence to establish the ability of hearing-impaired children to learn letter-sound associations or grapheme-phoneme patterns, though the materials and techniques of basal instruction emphasize phonic skills in primary reading. Harris and Sipay (1975) have suggested six prerequisites for phonics learning, the first of which is the ability to hear differences between similar-sounding words. If Harris and Sipay are right, deaf children may be unable to learn some or all phonic skills, depending upon the nature and severity of hearing loss.

The language usage and auditory processing abilities of hearing-impaired children must be identified if we are ever to determine the specific skills they should be taught and how the teaching program should be structured.

The major purpose was to describe the learning strengths and weaknesses of hearing-impaired children, and the reading skills developed by them in the course of basal reading instruction. The teachers of our student subjects used a Systematic Approach to Reading Instruction (SARI) as a management system to coordinate the reading instruction program. They wanted to use SARI objectives to facilitate mainstreaming of their students. They needed data by which they could evaluate the appropriateness of SARI objectives. Thus answers were sought to these questions:

1. Could we identify the relation of language development, auditory processing, and intellectual ability to knowledge of specific reading skills?
2. Could we identify the reading skill objectives that are most appropriate for the needs of the specific population with which we dealt?
3. Could we devise other appropriate, non-traditional, approaches to building word analysis skills in this population?
4. Could we modify existing reading materials to achieve our skill objectives?

Method

The target population consisted of 14 children from two self-contained classrooms for children with severe to profound hearing impairment. The school system employs a Total Communication approach that includes simultaneous speech and manual signing (Signed English).

Subjects

The sample consisted of 12 children whose parents signed consent forms. Six of the children were in primary grades and ranged in age from six years, nine months to nine years, three months. The other six children were in intermediate grades and ranged in age from nine years, nine months to eleven years, three months.

Procedures

Because of the special communications problems involved in gathering data from these children, an interdisciplinary team approach was employed. The team included: (a) a reading consultant; (b) an educational consultant specializing in education of the

hearing impaired; (c) a speech and language clinician; (d) an audiologist; (e) two classroom teachers trained to work with the hearing impaired; and (f) a graduate assistant. These procedures were followed.

Auditory acuity and speech discrimination. The audiologist assessed each child's auditory acuity on a pure tone audiometer, using speech frequencies, and each child's speech discrimination in a sound/field situation.

Word meanings and language structures. The Peabody Picture Vocabulary Tests (PPVT) were administered by the speech and language clinician to evaluate vocabulary development and to provide a language-based comparison measure for the Raven Progressive Matrices Test (RAVEN). Carrow's Test for Auditory Comprehension of Language (TACL) was administered to assess each child's ability to understand and respond to vocabulary (choose and correct picture), morphological changes (-er, -est, -ist), pronominalization (I, we, they), and number agreement (some fish, a fish). Both sign and speech were used in the administration. The Arizona Articulation Proficiency Scale (AAPS) was administered to evaluate the ability of each child to produce intelligible speech.

Intellectual functioning. The reading consultant administered the Raven Progressive Matrices Test (RAVEN) with the help of the educational consultant. The RAVEN was chosen as a measure of intellectual functioning because it is highly correlated with the Performance Scale IQ of the Wechsler Intelligence Scale for Children

(WISC), and because it is a nonverbal test of general intellectual ability. Two children were also given the Performance Scale of the WISC-Revised. The results were comparable to those obtained from the RAVEN.

Reading Skills. The Stanford Achievement Test-Hearing Impaired Edition (SAT-HI) was administered to the six older children. The teachers also administered these SARI skills tests to the older children: (a) synonym-antonym; (b) ability to sequence; (c) use of context; and (d) main idea. These were used to establish baseline data. SARI tests for inflectional endings, final consonant sounds, digraphs, and long and short vowel sounds were omitted, since the children could not understand the tasks required. The younger children were unable to complete any of the SARI tests.

Informal observation was used to assess the children's ability to read and comprehend books in the classroom. The teachers were asked to rate each child's speech, language, and reading abilities on a scale of 1 to 5 (1=high).

Design

Because of the limited information available on reading instruction for the deaf, the study was descriptive. Each child served as his or her own control, as in an "N of 1" case study. Post hoc comparisons among learning characteristics and skill test scores were used to prescribe instructional treatments for each child.

Results

Auditory Acuity and Speech Discrimination

Audiometric tests indicated severe to profound hearing losses in all but two of the children, who displayed moderate hearing losses.

Audiometric measures were recorded for later comparison with the other tests.

Word Meanings and Language Structures

Results of the PPVT, TACL, and AAPS tests indicated significantly lower scores than are typical for hearing children. The mean language quotient (PPVT) was 68. The mean language age for the primary children was 3.8; for the intermediate children it was 7.3. The mean age scores for the primary and intermediate pupils are summarized in Table 1.

The TACL results yielded an age equivalence range from 3.2 to 7.0 years. The mean age equivalence of the primary students was 4.7 years; for the intermediate children it was 6.9 years.

AAPS results indicated severe articulatory problems for primary children, with mean age equivalence below 3.0 years. Intermediate children displayed mean age equivalence of 3.0.

Those children with the least hearing loss in the speech range scored higher on all three language based measures. This is consistent with research reported by other investigators.

Intellectual Functioning

Results of the RAVEN indicated average to above average ability for all children. The mean estimated quotient for the twelve children was 108. When this nonverbal result is compared to the PPVT (language based) estimate of 68, the limited verbal knowledge of the students becomes apparent.

Reading Skills

Results of the SAT-HI yielded an independent reading level from 2.6 to 3.1 for the intermediate children, with a mean of 2.8. None

of the six children passed the SARI tests at level five.

Informal observation of the primary children indicated that these children could read independently at the preprimer level and instructionally at the primer level. As noted, these students were unable to take the SARI skills tests.

After instruction, the level five SARI posttest was readministered to the intermediate children. Results indicated that instruction had produced ability to: (a) identify synonym and antonym; (b) judge the sequence of three events; (c) use context; and (d) in two-thirds of the cases, to find the main idea.

The pretest for SARI level six (second reader, level II) indicated mastery for all pupils in: (a) compound words; and (b) recognition of Dolch words. The children failed pretests of: (a) synonyms and antonyms; (b) suffixes; (c) structural endings; (d) detail; and (e) main idea. Instruction was given in these areas. On posttest, 1/3 of the children passed the test of synonyms and antonyms; 1/2 passed the test of suffixes; all passed the tests of structural endings and detail; and 2/3 passed the test of main idea.

Results seem to indicate that skill instruction positively affects performance on posttests. Deaf children appear to learn skills in a manner similar to hearing children. Of course, we have not demonstrated that improved SARI skills affect overall reading performance. If knowledge of specific skills does affect overall reading performance, we may assume that the SARI system is a useful tool in classrooms for the hearing impaired. If knowledge of these

specific skills does not affect reading performance, we may assume that such skills do not determine reading performance and that the SARI system is probably irrelevant.

Teacher ratings of speech, language, and reading indicate that students who are high in language usage are not necessarily also high in reading performance.

Summary

The following general conclusions may be drawn from the test results, which are summarized in Table 1:

1. Hearing-impaired children score significantly below norms for hearing children on language and reading measures;
2. Audiometric and AAPS measures indicate that phonic instruction is probably of little value;
3. Ratings of the children's performance by teachers are inconsistent with test results.

The most common finding was lack of ability to comprehend standard English sentences. On the other hand, there appears to be only limited consistency among the language measures (PPVT, TACL, AAPS). Articulatory proficiency was related to speech discrimination, as one might expect, but was not related to success on the phonics tests. Neither articulatory proficiency nor vocabulary knowledge were highly related to sentence comprehension, nor were these three measures, alone or in combination, apparently related to reading performance, either in class or as measured on the SAT-HI.

Inconsistency between performance tasks (reading) and language measures, on one hand, and teacher ratings, on the other, leads us to question the utility of the SARI objectives. Based upon these results, we may say that deaf children have not learned typical primary word analysis skills, yet have developed reading ability beyond the predicted level if these skills (phonics) are essential prerequisites for reading. In our view, the essential skills for learning to read appear to be those related to comprehension of standard English sentences.

Discussion

Conclusion

In recent years, a number of theories have been proposed to account for the reading problems encountered by hearing-impaired children. Most of the research has focused on linguistic, cognitive, and phonological skills (La Sasso, 1978). Evidence from many studies (Furth, 1966; Quigley, Power, & Steinkamp, 1977; Wrightstone, Arrow, & Moskowitz, 1963) suggests that existing materials and approaches are inappropriate for hearing-impaired children because the children are unable to comprehend the language used in the teaching materials or are limited in their ability to learn the skills presented. But no modified materials suitable for use with the hearing impaired have been developed, because we have not yet fully specified the characteristics of their language development.

The research reviewed by Quigley, Power, and Steinkamp (1977) indicates a growing trend toward greater precision in linguistic analysis. The measures of language development currently available

still suffer from several inadequacies, however. Typically, they do not separate recognition from production tasks, are not adapted for administration to Total Communication children, and are not diagnostic. Successful curriculum modification seems to require a complete linguistic profile of each child's idiosyncratic pattern of vocabulary, syntax, and semantic skills.

Modification of Objectives

The original objectives were based on remedial procedures commonly used with hearing children who possess linguistic competence but deficient reading skills. Deaf children do not have the standard English competence prerequisite to reading skill development. Development of this competence is the logical first step.

However, the original instructional objectives were too advanced in the developmental hierarchy. Alternative objectives were formulated that would facilitate development of linguistic competence through reading and would provide materials more closely matched to the children's actual language ability. The alternative objectives were:

1. To assess the syntactic and semantic development of each child individually;
2. To identify the linguistic differences between the sign language used by the children and standard English;
3. To train the teachers of our children in language acquisition processes and methods of linguistic analysis so that they could successfully individualize reading instruction;

4. To select from existing approaches to reading instruction the one(s) most suited to the special needs of the hearing impaired;
5. To adapt the selected materials to correct for any mismatch between language texts and the measured or observed language competence of the children;
6. To encourage the development of word knowledge in the children through a variety of concrete experiences;
7. To provide the children with sufficient exposure to linguistic structures to allow them to make generalizations concerning the rules of English;
8. To expose the children to a wide variety of figurative language, with special emphasis on the forms they will encounter in their reading;
9. To teach the children how to predict words using the reading context;
10. To teach the children to assign meaning to an unfamiliar word by using the reading context;
11. To replace phonics practice with practice designed to promote familiarity with and comprehension of linguistic structures;
12. To create a classroom management system to correlate language development and audio-visual materials to specific study units.

Progress to Date

Testing materials from the fields of speech and hearing that are currently used to evaluate the syntactic and semantic development of children have been collected. Several experimental test models were collected from recent literature. To date, we have been unable to identify any tests that meet all our requirements. We have written Gallaudet College for additional information.

Several reading systems were reviewed. The Scott Foresman Reading Unlimited system was recommended for purchase because of its psycholinguistic orientation.

The materials selected for use with the children have been analyzed and adapted to match the children's linguistic competence. Typewriter white-out was used to change wording. Methods and materials for teaching linguistic structure and related meaning were prepared. Special practice materials, including games and worksheets, were developed. A variety of experiences were devised to encourage the development of word meanings. These included field trips, games, cooking, filmstrips, movies, plays, poetry, and pictures.

To provide increased exposure to linguistic structures, the teachers were taught to use expanded sign. In this use of sign language, the teacher employs several different transformations of sentence, each of which has the same meaning as the original sentence. The teacher provides variety of structure and subtle differences of meaning among words that have the same sign. The use of expanded sign is designed to approximate the linguistic expansions typically provided hearing children by parents, peers, and teachers. Collections

of books at the children's independent reading levels were borrowed from the media center to provide additional exposure.

Special cartooning exercises were created to develop knowledge of figurative language and idiomatic expression. Teachers were encouraged to develop an awareness of forms of figurative speech. They assisted in the development of methods of explanation. Cloze procedure was used to develop prediction of words and assignment of meanings through context.

Comprehension exercises to assist the children in recalling factual detail, assigning the main idea, and drawing inferences were also designed.

A classroom management system was also developed. Vocabulary and phrase cards were prepared and filed for each study unit. Appropriate kits, film, filmstrips, and books from the area materials center were listed and correlated with study units. Plans for language exposure and awareness experiences were created. A filing system for worksheets and auxiliary materials was prepared.

Finally, the following objectives were established for our future efforts:

1. To complete a thorough assessment of each child's linguistic development through use of tests now available and a new test to be constructed;
2. To continue training of the teachers in linguistic analysis;
3. To increase our explorations of the etiology of the language differences of the hearing impaired;

4. To continue modification of materials and development of the management system for levels 3, 4, 8, and 9 of the Scott Foresman system;
5. To add new teachers who have expressed interest in the project to our project team.

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Table 1

Mean Age Scores of Language,

Vocabulary, and Articulation

	AAPS	TACL	PPVT
Primary	-3.0	4.7 yrs.	3.8 yrs.
Intermediate	3.0	6.9 yrs.	7.3 yrs.